University of Burgundy
Image Processing
(Lab Report-3) :: Professor: Dr.SIDIBE
Student: VAMSHI KODIPAKA

Exercise 1 :: Image Filters

Explanation: Filtering is a technique for modifying or enhancing an image. For example, you can filter an image to emphasize certain features or remove other features. Image processing operations implemented with filtering include smoothing, sharpening, and edge enhancement

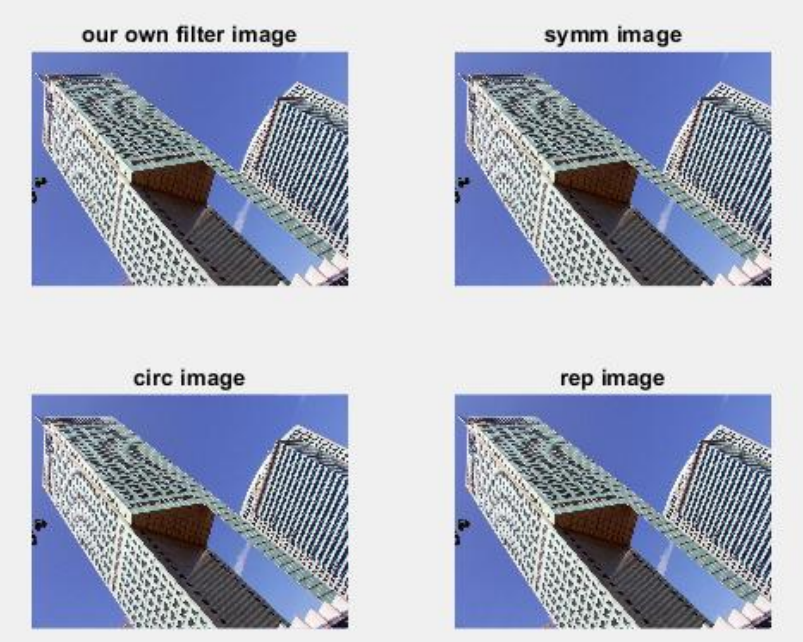
Implementing filter and plotting: building.jpg

1. Given filter is:: M = [1 4 1; 4 16 4; 1 4 1]/36;
2. applying same filter by properties :: symmetric, circular, replicate

Reading input images: building.jpg **Output:**

Working:

1. **Read input image building.jpg.**
2. **Make filter and apply special properties like symmetric, circular, replicate.**
3. **Display the original and output image.**



Exercise 1.1 - Linear Filtering

Explanation: Linear filtering is filtering in which the value of an output pixel is a linearcombination of the values of the pixels in the input pixel's neighborhood.

Implementing average and Gaussian on : saturn.png and saturn_noise.png

1. Given filters are::

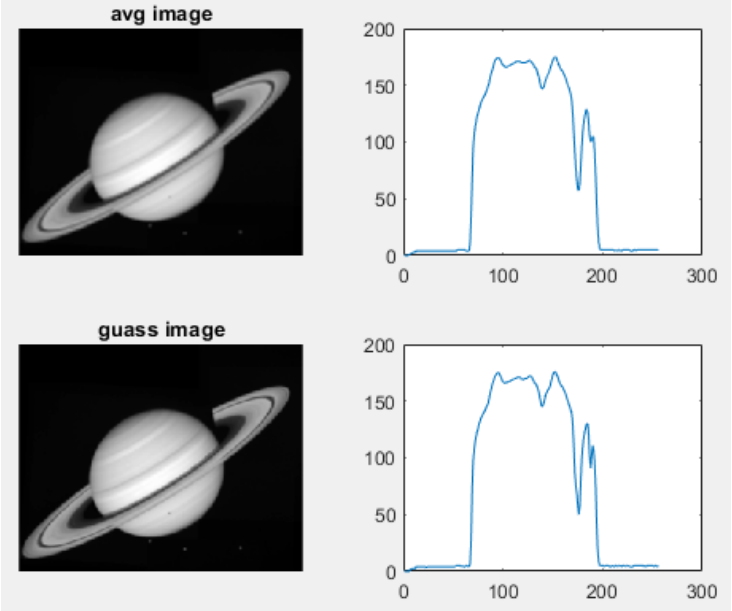
```
M_avger = ones(3)/9;
M_gaussian = [1 4 1; 4 16 4; 1 4 1]/36;
```

2. applying same filter by properties :: symmetric

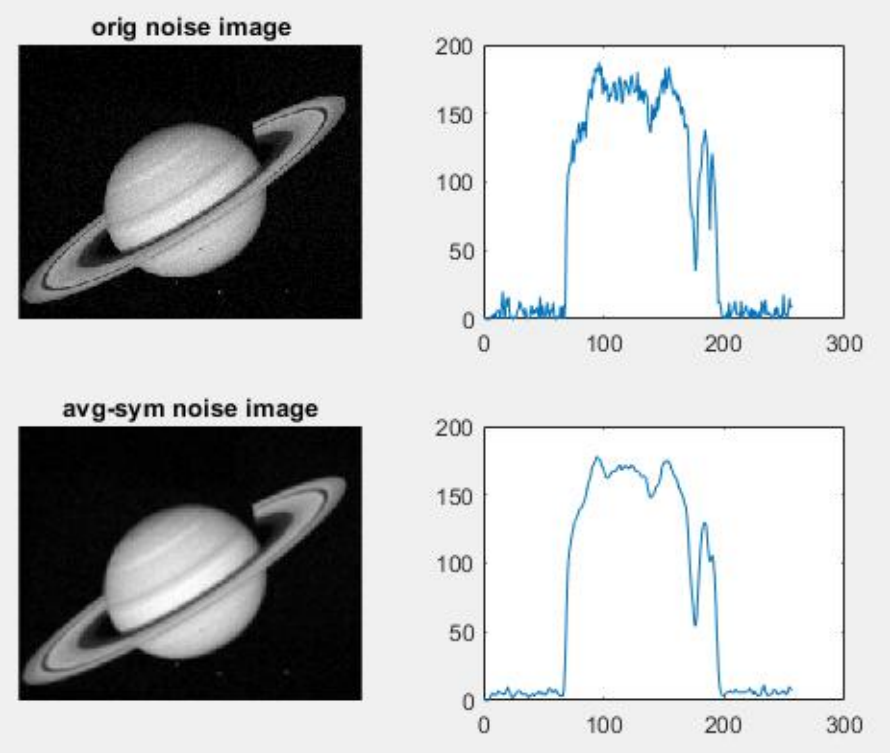
Reading input images:: saturn.png

Working:

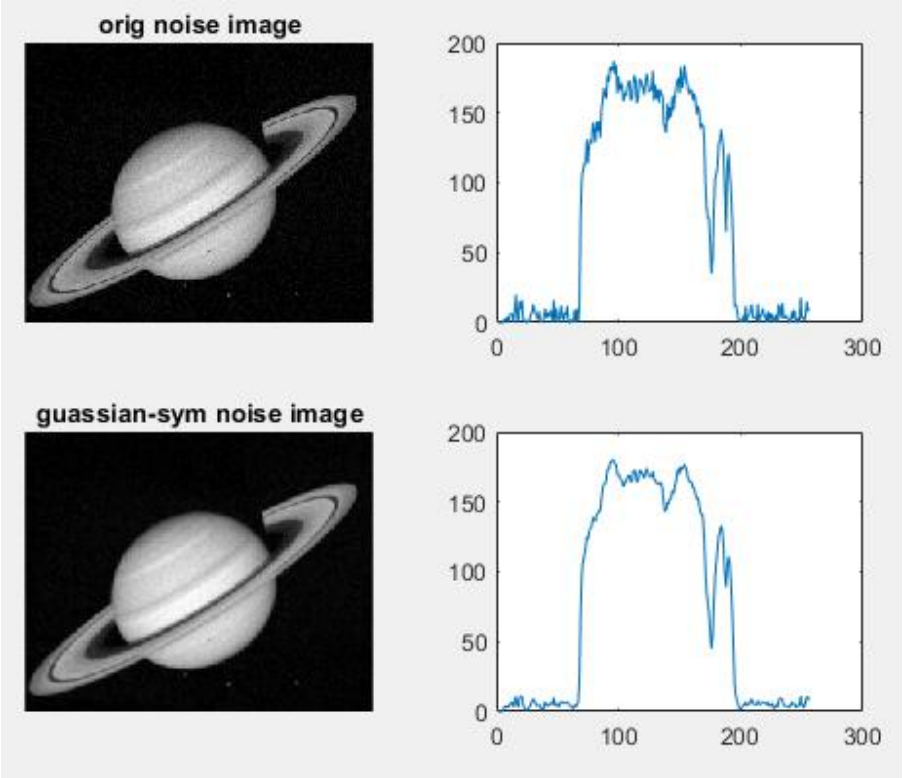
1. **Read input image saturn.png and saturn_noise.png.**
2. **Apply the average and Gaussian filters.**
3. **Display the output.**



Reading input images and displaying output:: saturn_noise.png**(using average filter)**



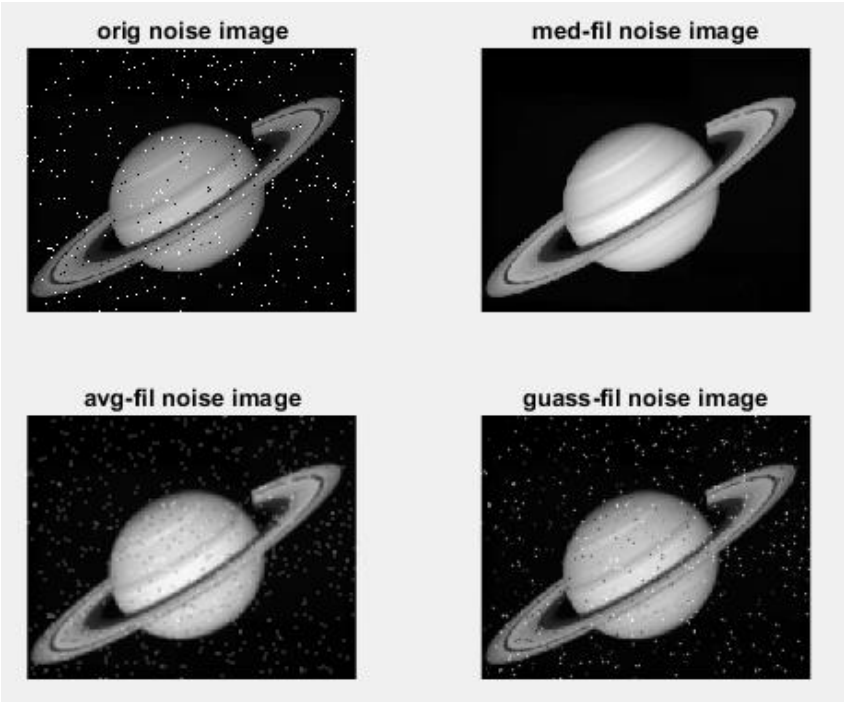
Reading input images and displaying output:: saturn_noise.png(using gaussian filter)



Exercise 1.2 - Non-linear Filtering

Explanation: A non-linear filter is a filter whose output is not a linear function of its input. Like linear filters, nonlinear filters may be shift invariant or not. Non-linear filters have many applications, especially in the removal of certain types of noise that are not additive.

Implementing median, average and Gaussian on : saturn_noise2.png



Reading input image:: saturn_noise2.png

Working:

1. **Read input image saturn_noise2.png.**
2. **Apply the median, average and Gaussian filters.**
3. **Display the output.**

Output :: observe above figure

Exercise 2 - Edge Detection

Explanation: Edge detection is an image processing technique for finding the boundaries of objects within images. It works by detecting discontinuities in brightness. Edge detection is used for image segmentation and data extraction in areas such as image processing, computer vision, and machine vision.

2.1 - Sobel Filters

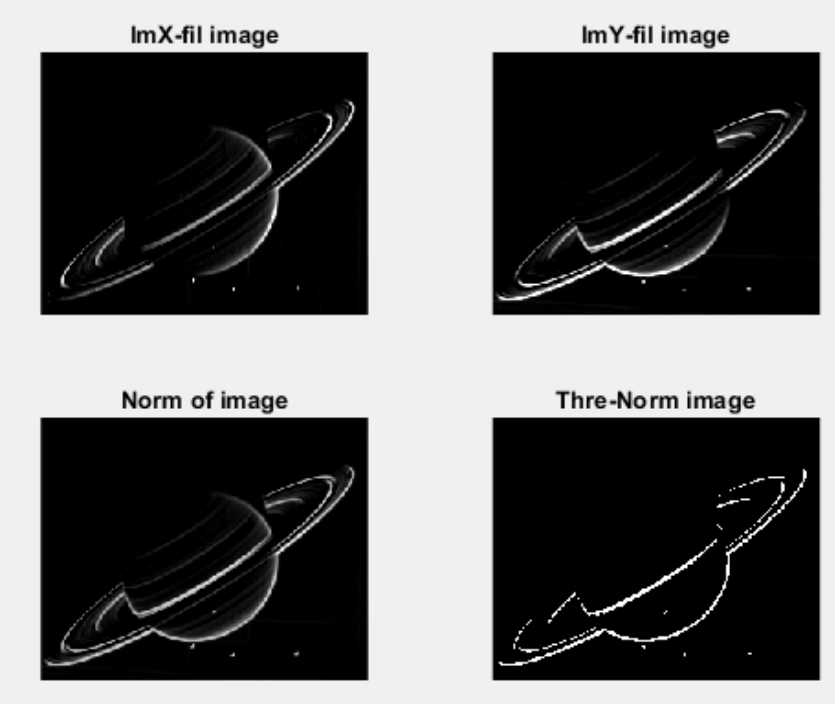
Reading input image:: saturn.png

Working:

1. **Read input image saturn.png.**
2. **Apply Sobel below filters.**
   Matx = [1 0 -1; 2 0 -2; 1 0 -1];
   Maty = [1 2 1; 0 0 0 ; -1 -2 -1];
3. **Calculate Norm and Threshold of Norm of the output image.**
4. **Display the final output.**

Implementing Sobel filter (Filt-X and Filt-Y) on : saturn.png

Output :: observe above figure



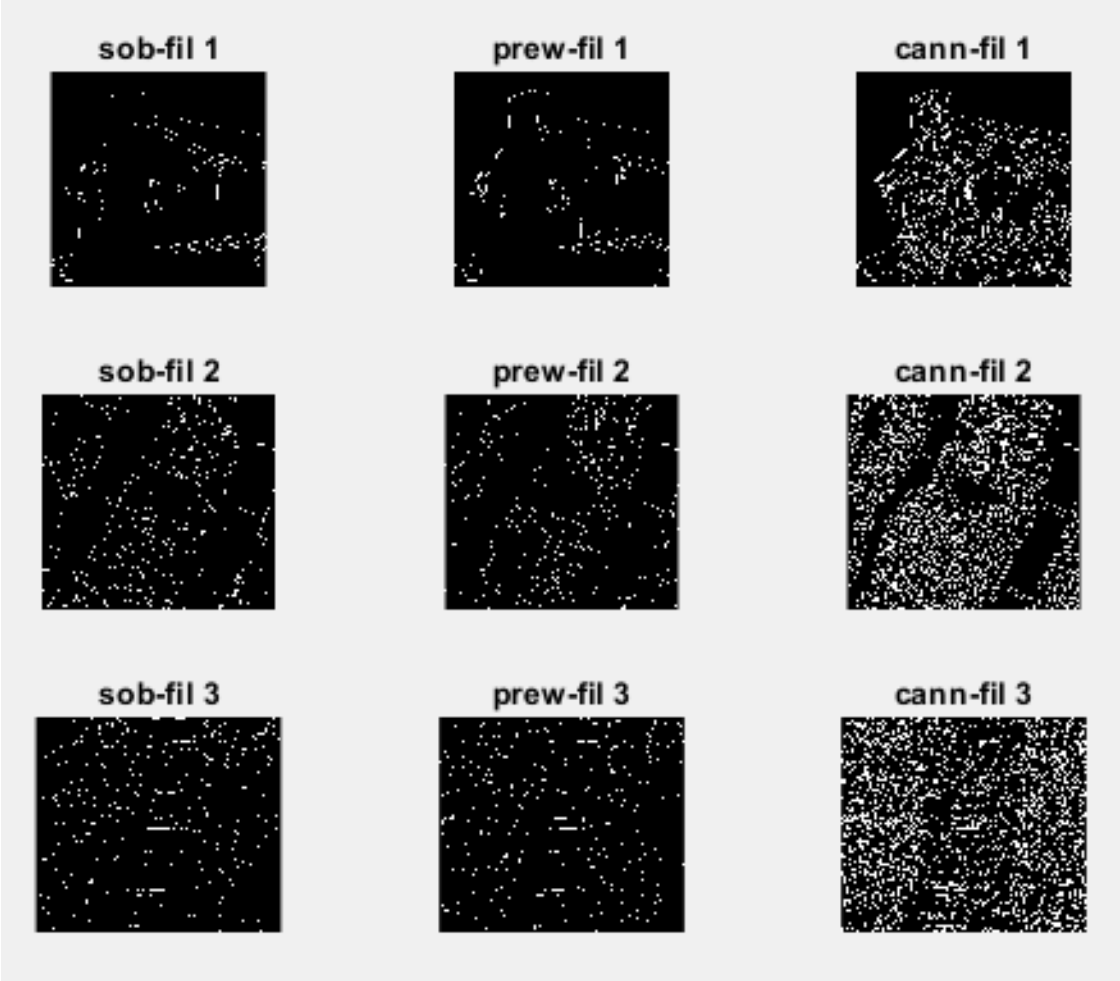
Exercise 2.2 - Comparision of Edge detection

Reading input images:: house.jpg, satellite.jpg, railway.jpg

Implementing Sobel, prewitt and canny detectors on :: each of above 3 images

Function working:

1. **Read input image** house.jpg, satellite.jpg, railway.jpg
2. **Using Sobel, prewitt and canny detectors for the input images.**
3. **Plot the images and display the edge detection outputs.**



Output :: observe above figure

Exercise 3 – Hough Transform

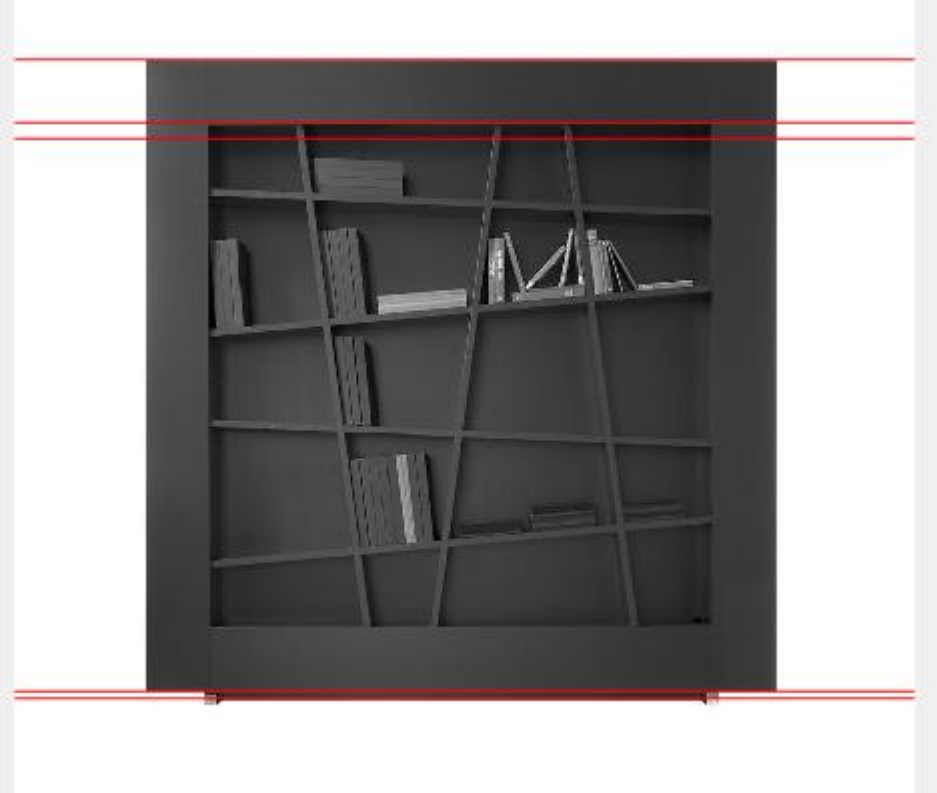
Reading input images:: biblio.jpg and railway.jpg

Explanation: The Hough transform is a feature extraction technique used in image analysis, computer vision, and digital image processing. The purpose of the technique is to find imperfect instances of objects within a certain class of shapes by a voting procedure.

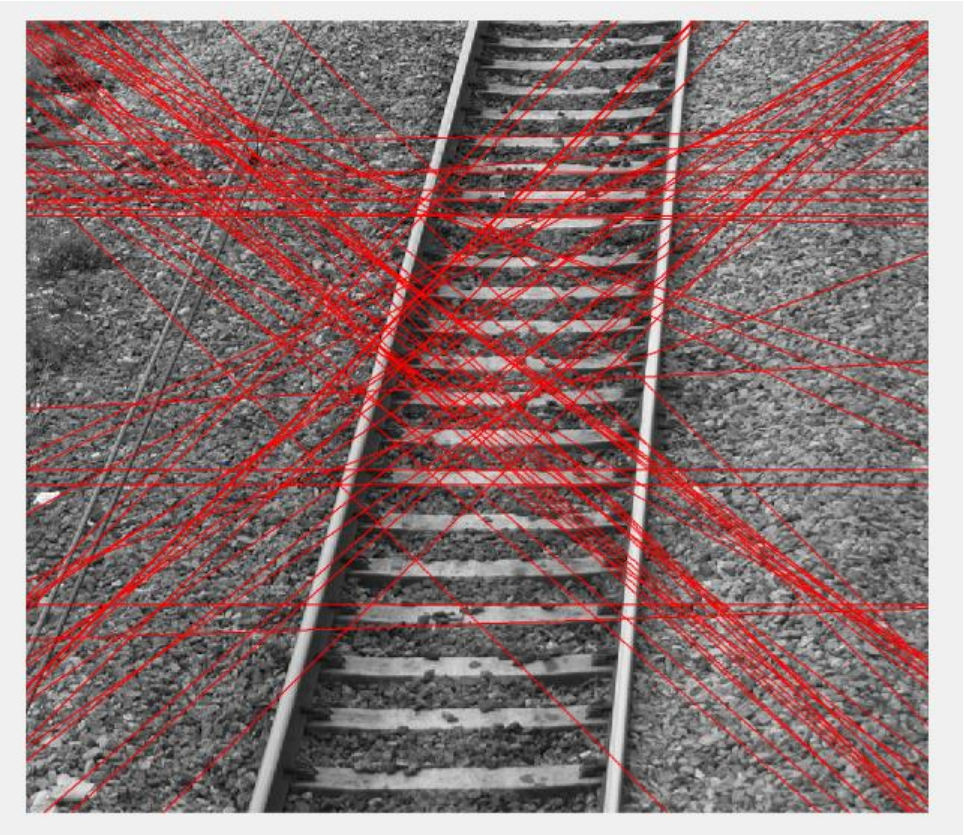
Implementing Function Hough Transform on :: biblio.jpg and railway.jpg

Function working:

1. **Read input image** biblio.jpg and railway.jpg
2. **Implement Hough Function.**
3. **Apply canny edge detector image and convert to rho-theta plane.**
4. **Loop for Hough-points in x-y coordinated to convert to lines in rho-theta plane And vice-verse.**
5. **Display the output.**



biblio.jpg



railway.jpg

Output :: observe above figures